

WHAT IS CLAIMED IS:

1. An apparatus comprising a quantizer circuit which includes:

5 a resonant tunneling device having two ends, and having an operational characteristic which includes a first region of unstable operation and second and third regions of stable operation;

10 an input terminal coupled to one of said ends of said resonant tunneling device;

an output terminal coupled to said one end of said resonant tunneling device;

15 a bias section coupled to said resonant tunneling device and having first and second operational modes which are mutually exclusive, said bias section being responsive to a clock signal for operating selectively in each of said first and second operational modes in an alternating manner, wherein in said first operational mode said bias section forces said resonant tunneling  
20 device to operate within said first region, and wherein in said second operational mode said bias section permits said resonant tunneling device to operate in either of said second and third regions.

25 2. An apparatus according to Claim 1, wherein said quantizer circuit is a latch circuit.

3. An apparatus according to Claim 1, wherein said resonant tunneling device is a resonant tunneling diode.

4. An apparatus according to Claim 3, wherein said second and third regions of said resonant tunneling diode are spaced regions of positive differential resistance in a current-to-voltage characteristic thereof, and said first region is a region of negative differential resistance disposed between said second and third regions.

5. An apparatus according to Claim 3, wherein said bias section includes a constant current portion coupled to said one end of said resonant tunneling diode, and includes a further portion coupled between a source of power and said one end of said resonant tunneling diode, said further portion being responsive to said clock signal for switching between first and second states in which said further portion has significantly different degrees of conductivity, said first and second states respectively corresponding to said first and second operational modes.

6. An apparatus according to Claim 5, wherein said constant current portion includes a field effect transistor coupled between a source of power and said one end of said resonant tunneling diode, with the gate of said field effect transistor coupled to one of the source and drain thereof.

7. An apparatus according to Claim 5, wherein said  
further portion includes a field effect transistor  
coupled between said source of power and said one end of  
5 said resonant tunneling diode, said clock signal being  
applied to the gate of said field effect transistor.

8. An apparatus according to Claim 5,  
wherein said clock signal is an optical clock signal  
10 in the form of varying photonic energy; and  
wherein said further portion includes a  
photosensitive device which is responsive to said optical  
clock signal and which is coupled between said source of  
power and said one end of said resonant tunneling diode.

15 9. An apparatus according to Claim 8, wherein said  
photosensitive device is a photodiode.

10 10. An apparatus according to Claim 5, including a  
capacitor coupled between said input terminal and said  
one end of said resonant tunneling diode.

11. A method of operating a quantizer circuit which includes a resonant tunneling device with two ends and an operational characteristic, and an input terminal and an output terminal which are each coupled to one of said ends of said resonant tunneling device, comprising:

selectively biasing said resonant tunneling device to operate in a first operational mode in which said resonant tunneling device is forced to operate within a first region of said operational characteristic thereof involving unstable operation;

selectively biasing said resonant tunneling device to operate in a second operational mode mutually exclusive from said first operational mode, in which said resonant tunneling device is permitted to operate in either of second and third regions of said operational characteristic which each involve stable operation; and

responding to a clock signal by selectively operating said resonant tunneling device in said first and second operational modes in an alternating manner.

12. A method according to Claim 11, including configuring said quantizer circuit to be a latch circuit.

13. A method according to Claim 11, including selecting a resonant tunneling diode as said resonant tunneling device.

14. A method according to Claim 13, including  
selecting said second and third regions to be spaced  
regions of positive differential resistance in a current-  
to-voltage characteristic of said resonant tunneling  
5 diode, and selecting said first region to be a region of  
negative differential resistance disposed between said  
second and third regions.